

Water treatment - iron control

For general on-farm water supplies

Do you have any of these problems?

- water has an unpleasant taste
- red staining on farm equipment or in dairy
- red staining on garden fixtures
- red or brownish staining on crop leaf
- red or brownish slime in pipes and fittings

Causes

These problems can be caused by the presence of dissolved iron in the water. Iron not only causes red staining but also promotes the growth of iron bacteria. These form thick slimes on the walls of pipes and fittings.

Although all water supplies will contain some iron, normally most problems are associated with groundwater supplies.

In surface supplies iron can show up as a red or brownish colour in the water. When pumping from a bore, the water may be clear until oxygen is introduced by exposure to the air. The dissolved colourless ferrous oxide is then oxidised into a red ferric iron precipitate.

Iron levels

Iron content in water is measured in milligrams per litre (mg/L). The form of treatment, if any, should be considered based on the end use and the iron content of the water.

An acceptable limit for domestic use is 0.3 mg/L. Above this level staining of clothes and fixtures is likely to occur.

For watering systems, iron above 0.5 mg/L has caused blockages in small diameter pipes. Growth in plants can be retarded when iron is greater than 2.0 mg/L. If it is more than 5.0 mg/L it can be toxic to plants.

Preventative measures

- When pumping from farm dams keep the suction as close to the surface as possible by attaching it to a raft or plastic drum.
- If pumping from a bore, seal off the top of the bore to exclude air.
- Avoid cascading water inside the bore.

Treatment measures

Treatment measures normally involve one or a combination of the following oxidation processes.

- Aeration/settling
- Chlorination
- Addition of potassium permanganate

Aeration/Settling

This form of treatment would usually be undertaken when the water supply contained large amounts of iron (greater than 1 mg/L). Water is sprayed into the air and/or cascaded over baffles into a settling tank. After settling for a few hours, the water is then drawn off through a high level outlet. If you can, use two tanks, one being used as storage while the other is filled and allowed to settle. Periodic flushing of sludge from the tank via a bottom outlet plug is necessary.

If the water has a low pH, hydrated lime should be added to increase pH to about 8.0 to assist the settling process. Hydrated lime added at rates of 30 grams per 1000 litres of water is often used. Too much can create hard water.

Chlorination

Chlorination can be carried out separately or in combination with aeration. Chlorine is a powerful chemical oxidant which converts the soluble iron into the red ferric oxide precipitate. With time the insoluble iron precipitate will settle out.

Chlorine also acts as a disinfectant which kills iron bacteria on contact. The effectiveness of the treatment will depend on dosage rates, pH of the water, contact time, water temperature and turbidity.

Although it is difficult to make a general recommendation because of these factors, a good starting point is a continuous injection of chlorine to achieve 0.2 mg/L residual chlorine. This residual, which is the free chlorine remaining in the water, can be measured with a standard swimming pool test kit.

Chlorine is very corrosive and highly toxic. Manufacturer's instructions should be followed at all times.

Caution: If you need to treat water for human consumption, get advice from an authoritative source such as the Queensland Health Department, your local Council, or some other competent person.

Potassium permanganate

Potassium permanganate (purple Condy's crystals) is often used with manganese greensand. Best results are achieved where pH is in the range 6.8 to 8.8. After the greensand has been treated with potassium permanganate it oxidises the iron to its insoluble oxides. The greensand will also act as a filter. These are commonly referred to as greensand filters.

After backwashing to remove the insoluble iron oxides, regeneration with potassium permanganate solution is carried out to maintain the process. The greensand is recharged until pink water flows out of the greensand media. The flow is then decreased until a slight pink colour appears. There should be no pink colour after filtration.

Other media

Media which do not require chemicals for regeneration are often used in the commercial and industrial fields. These media contain base minerals coated with manganese dioxide. Two such products are known as zeolites and birm. They act as catalysts to improve the oxidation process. Periodic backwashing is necessary to remove the precipitated iron.

These media work best when pH, alkalinity, dissolved oxygen, dissolved iron and manganese are within certain limits.

Proprietary products

There are other patented water stabilising products on the market which reputedly control iron staining. Check with the manufacturer to ensure results can be guaranteed.

Filtration

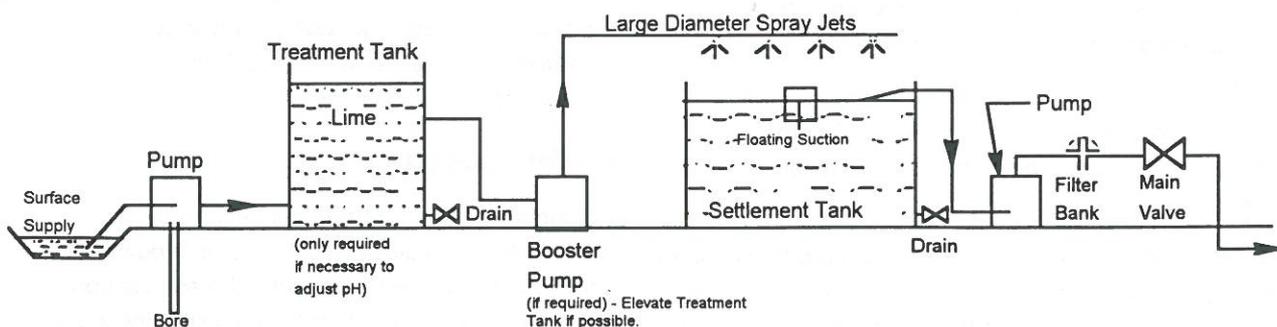
Filtration alone does not remove iron efficiently. Only particles of oxidised iron will be removed by filtration. Oxidation by aeration, chlorination or use of potassium permanganate or other media is necessary first.

Water analysis

Before undertaking any water treatment a complete water analysis should be carried out. Sampling procedures and where you can have the water analysed are outlined in Water Facts Sheet 'Sampling Your Water Supply'.

Assistance

Assistance with all aspects of your water supply, irrigation or drainage scheme is available from the Rural Water Advisory Services of the Department. Full details can be obtained from your local Natural Resources office. ■



Aeration-settling layout for iron removal